Transportation Research Newsletter

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Website: http://www.state.me.us/mdot/planning/research.htm

Project to Test Radar-Activated Changeable Message Sign

The Transportation Research Division is testing new equipment designed to help reduce the incidence of speeding in construction work zones. A new project will test the effectiveness of radar-activated dynamic signs in reducing vehicle speeds. The new project will utilize a radar-activated, trailer mounted, changeable message sign (CMS). The CMS

speed trailer has been purchased through the Federal Safety Incentive Grants Program. The unit will be tested in various locations before being permanently assigned to routine use in Maintenance and Operations.

Maine DOT often uses conventional portable CMS trailers to warn drivers of impending roadway and traffic conditions. The new unit, however, has new software that has enhanced capabilities to create custom messages and graphics. In addition to the onboard radar, the unit has a cell phone modem so that it can be controlled remotely from any PC with a modem. In operation, the radar unit will detect actual vehicle travel speed as the vehicle approaches the sign. If the vehicles speed is above a preset limit, a warning message will immediately display the actual vehicle speed together with warning messages.

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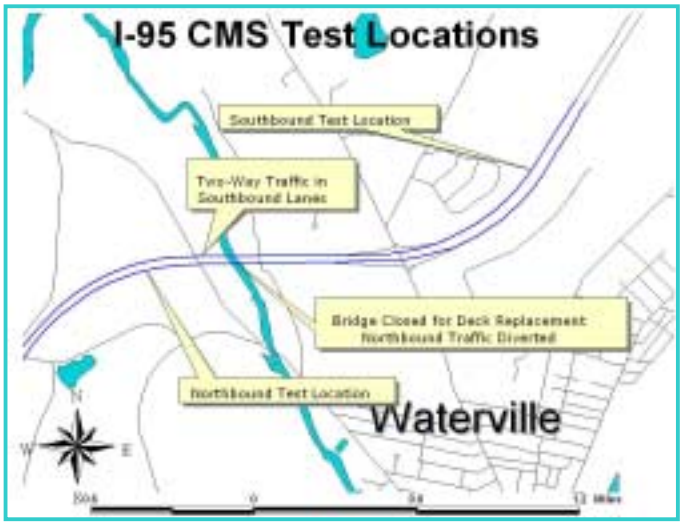
The CMS speed trailer has already proven its effectiveness in a pilot test on the current Waterville I-95 bridge deck replacement project. The test was set up to complement existing traffic control that is in place for the first phase of the multi-year bridge deck replacement project. In order for work to proceed on the northbound bridge deck, northbound travel lanes have been diverted through a median crossover lane into the southbound passing lane, so that the normal southbound lanes are carrying two-way traffic.

The CMS unit was tested on both northbound and southbound lanes using a “before-and-after” test. First, vehicles were clocked with the sign in place but not activated. Then the sign was switched on and vehicles were clocked with the sign activated. The results were very positive; the average speed of northbound vehicles was reduced by about 7 mph when the sign was activated, while southbound speeds were reduced by



about 12 mph when the sign was activated. In addition, a reduction in speed variance was noted, resulting in a more uniform traffic flow. These results however, are based on only a small sample of traffic during the test period. Additional testing will be done to further evaluate the effectiveness of this technology.

Dynamic Warning Signs

INSTALLED AT A RURAL MAINE INTERSECTION

Collisions at intersections are one of the most common types of vehicle crashes in Maine. Many stop-controlled locations contain severe sight distance limitations that exacerbate the safety problem. While the installation of traffic signals could significantly improve the safety of these intersections, traffic signal warrants often cannot be met, and potentially significant mainline traffic delays could result. Also, many sight restrictions are caused by buildings, horizontal and/or vertical curves, or natural features. The cost to eliminate these obstacles is prohibitive. There are many such intersections in Maine where it is impossible to provide sight distances as recommended by State and AASHTO standards or to meet the requirements of the Manual on Uniform Traffic Control Devices (MUTCD) for signalization.

In an effort to improve the safety of these intersections, the Maine Department of Transportation embarked upon a pilot project to develop a dynamic, traffic-actuated warning system, primarily to warn minor leg traffic of approaching traffic. In February of 2001, a pilot system was installed at a rural intersection where, a multi-arch concrete bridge with large structural concrete columns and railings limited site distances in one direction at a stop-controlled intersection.

Norridgewock Intersection Chosen for Pilot System

The signs warn drivers waiting at the stop signs on the minor approaches when traffic is approaching from either direction. At right is a close-up view of one sign when activated by a vehicle approaching from the right.

For more information contact Bill Thompson at 207 287-2732 or email at william thompson@state.me.us

Eastbound Approach – Sign Indicating Vehicle from Right

The system is currently under evaluation, but preliminary results are promising. Based upon traffic conflict studies conducted before and after installation of the new signs, traffic conflicts have decreased substantially and critical gap times have increased considerably. The traffic conflicts studies have shown a decrease in conflicts at the intersection of 35% (as measured by the FHWA Method). In addition, based on the results of a driver survey, two out of three respondents favor the sign. Some respondents, however, expressed concerns with increased traffic delays, system timing and the potential for drivers to rely too heavily on the warning signs.

Crash data will be used over the long term to study the effectiveness of the project. If the new system is found to reduce risk significantly over the long term, then this type of signage could be installed at other hazardous stop-controlled intersections within the State.

Westbound Approach – Sign in Rest Mode

Utility Pole Crash Study Completed

Between the years of 1994 and 1998, there were 7,544 crashes involving utility poles in Maine, resulting in 54 fatalities and 4,077 injuries. Based on number of fatalities per hundred million vehicle miles traveled, this ranked Maine 9th nationwide. The primary goal of this research is to determine optimal utility pole offset distances and also to identify potential alternative treatments where pole relocation is not possible.

A database of utility pole crashes between 1994 and 1998 was developed to isolate contributing factors for each crash such as light condition, roadway geometry, surface condition, type of shoulder, speed limit, and hour of day / day of week. The database analysis revealed 74% of utility pole crashes and 87% of fatalities occurred in rural areas. Curved roadways accounted for 38% of utility pole crashes and 59% of the fatalities. One third of all crashes and 28% of fatalities occurred on roads posted at 72 km/h (45 mph), which represents 44% of Maine's roadways. Twenty three percent of crashes and 24% of fatalities occurred on roadways posted at 56 km/h (35 mph), which represents 7.2% of Maine's roadways.

A visual analysis of crash sites with two or more crashes in three consecutive years revealed that over 70% of utility pole crashes occurred on roads with gravel, narrow gravel or no shoulders. Utility poles installed across tee intersections were noted at fifty-three of the sites. Nine areas had utility poles in medians or traffic islands. Seventy-four areas had utility poles installed on slopes greater than 4:1 with 81% of those areas posted at 70 km/h (45 mph) or greater and 80% have gravel or no shoulder.

Results of this research have generated several recommendations to help reduce the number of fatalities caused by collisions with utility poles.

1. Review crash records annually to identify high crash areas for possible corrective measures such as relocating poles or using an alternative safety structure. Also review crash records on projects scheduled for structural or light overlay to determine if utility pole offsets should be increased.
2. Utility pole offsets should be greater than 2.4 m (8 ft) on roadways posted at 40 - 55 km/h (25 - 35 mph), greater than 4.3 m (14 ft) on roadways with posted speed limits of 65 - 70 km/h (40 - 45 mph), and greater than 6 m (24 ft) on roadways with speed limits of 80 km/h (50 mph) or greater.
3. Eliminate poles in medians, traffic islands, and across from T type intersections or use alternative safety structures when these poles cannot be relocated.
4. Eliminate the use of poles on both sides of the road by grouping all utilities on one line of poles.
5. Reduce the number of poles on outside curves and increase the offset distance when poles are located on slopes greater than 4:1.
6. Wherever utility poles cannot be placed a sufficient distance from the road, consider installing appropriate alternative safety structures such as steel-reinforced (breakaway) poles, low-profile concrete barriers, guardrail and soft concrete cushions.

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Pedestrian Safety Study

MDOT is nearing completion of a comprehensive pedestrian safety study aimed at providing recommendations in the form of a "Pedestrian Design Guide". The study draft report prepared by Per Garder of UMaine is being reviewed by the technical oversight panel. The guidelines are based on an extensive literature review, field observations at five communities, crash data analysis, and interviews.

Highlights from the draft Guide include development of pedestrian network plans in every community, pedestrian right of way in marked and unmarked crosswalks, and more effective education of our children as pedestrians and in driver education. Crosswalks with "zebra" marking, more effective signing, and dynamic advance warning signs with pedestrian activation features are also suggested. Traffic calming measures to reduce vehicle speeds below 30 mph and roundabouts where appropriate are recommended.

The report and Pedestrian Design Guide will be completed soon. Implementation will be accomplished through our Maine Local Roads (LTAP) Program, Safety Management Program, and Pedestrian Coordinator efforts.

Recent Publications

Experimental Construction 92-34, Sixth Interim Report, ***Field Trial of Gravel Stabilization Methods in Rt. 1 - Van Buren***

Experimental Construction 95-02, Final Report, ***Reflective Crack Control in HMA Pavements Using Glass Fiber Mesh and Membrane Materials***

Experimental Construction 96-2, Fourth Interim Report, ***Longitudinal Joint Study for HMA Pavement in Caswell - Van Buren***

Experimental Construction 96-25 & 97-19, Third Interim Report, ***Experimental Use of Sawed and Sealed Joints in HMA Pavements to Minimize Thermal Cracking***

Technical Report 97-10a, Interim Report, ***Performance of a Soil Nail Wall in a Frost Susceptible Environment: Results from the First and Second Winters***

Experimental Construction 97-20, Third Interim Report, ***Subsurface Drainage for Rehabilitation of PCC Pavement in Gray - New Gloucester***

Experimental Construction 98-3, Third Interim Report, ***Potential Benefits of Adding Emulsion to Reclaimed Base Material***

Technical Report 99-4, Final Report, ***Quality Assurance Specification Review for Hot Mix Asphalt and Structural Concrete***

Experimental Construction 99-8, First Interim Report, ***Experimental Use of Geogrids As An Alternative to Gravel Placement***

Experimental Construction 99-11, Second Interim Report, ***Innovative Solutions to Buried Portland Cement Concrete Roadways***

Experimental Construction 00-7, First Interim Report, ***Evaluation of Hot and Cold Crack Sealing Methods and Materials***

Technical Report 00-8, Final Report, ***Utility Pole Crash Modeling***

Technical Report 01-6, Final Report, Statewide RWIS network location Plan.

Experimental Construction 00-20, Construction Report, ***Experimental Utilization of Tire Shreds to Enhance Highway Drainage***

Experimental Construction 01-3, Construction Report, ***Experimental Installation of Geosynthetic Pavement Reinforcement to Reduce Reflective Cracking at the Auburn Airport***

Upcoming SP&R studies for FY02/03 program

Permeability of Base Material for Maine Roads - This study will conduct lab and field measurements of various pavement structures using a variety of subbase materials. Field testing of materials with adequate permeability are planned for the next two years. Projects have been selected that will include test sections of these materials in order to evaluate constructability, maintenance and performance. This study will conduct lab and field tests on these projects. The most economical permeable subbases will be identified.

Safety at Traffic Signals - Studies conducted by the Insurance Institute for Highway Safety show an increasing number of drivers running red lights causing a decline in signalized intersection safety. This study will take a look at reasons drivers run red lights (intentional or unintentional) and provide recommendations on reconstruction and retiming of signals and the use of ITS technologies to improve intersection safety.

Relating Pavement Thickness to Performance - The Department's Pavement Preservation Program includes hot mix asphalt overlay treatments of varying thicknesses. However, there is no good data to support use of thicker or thinner overlay thicknesses. This study will conduct accelerated load testing on HMA overlays of 30mm, 40mm, and 50mm.

Communication Solutions for Maine DOT - Effective data communications is critical to the Department's mission. Large volumes of data must be shared amongst central and division offices as well as other remote locations. This study will explore options such as wireless, fiber optics, short wave radio, compression and transmission technologies. Recommendations will be developed on cost effective communication solutions that will meet present and future needs, including ITS deployments.

Integral Abutments for Shallow Ledge Conditions - Integral abutment systems are constructed for spans up to and in excess of 100 ft. where ledge is located a minimum of 15 to 20 ft. deep. Significant cost savings result from construction of these types of structures. This study will attempt to broaden the applications for pile supported integral abutment by developing a solution for shallow ledge conditions.

Safe Ways to School - The percentage of children who walk or bicycle to school has declined in the last thirty years from over 80% in the 1960's to less than 20% today. There has also been an increase in childhood obesity during this period. This study will identify obstacles to walking and biking to school and develop low cost measures to improve this situation.

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